

AMENDMENTS TO THE CLAIMS

Please cancel claims 1-17 and add new claims 18-33.

1-17. (Cancelled)

18. (New) A fluid coupler comprising:

a female coupler member having

(i) an interior surface defining a male coupler member receiving hole having an

axis, and

(ii) a first fluid passage having an end opening at said interior surface;

a male coupler member having

(i) an exterior surface, and

(ii) a second fluid passage having an end opening at said exterior surface,

said male coupler member being insertable into said male coupler member

receiving hole along said axis such that said exterior surface extends parallel to said axis and so as to bring said male coupler member into a fixed connection condition in which said male coupler member is fixedly connected to said female coupler member and retained at a fixed connection position relative to said female coupler member, with the fixed connection condition being designed to be canceled or broken, when an excessive tension is applied to a fluid line in which the fluid coupler is installed, via tension acting on said female and male coupler members that causes said female and male coupler members to separate from one another;

a spring member for applying a force to said male coupler member, after being inserted within said male coupler receiving hole, so as to hold said male coupler member at the fixed connection position; and

a first valve mounted on said interior surface and positioned between said exterior surface and said interior surface when said male coupler member is inserted within said male coupler member receiving hole, said first valve having an outer surface and an inner surface to be slidably engaged with said interior surface and said exterior surface, respectively, when said male

coupler member is inserted within said male coupler member receiving hole, said first valve also having a through hole having an outer end opening at said outer surface and an inner end opening at said inner surface,

such that when said male coupler is in the fixed connection condition, said outer end of said through hole and said inner end of said through hole are aligned with said end of said first fluid passage and said end of said second fluid passage, respectively, so as to effect fluid communication between said first fluid passage and said second fluid passage, which fluid communication is to be canceled due to loss of at least one of alignment of said outer end of said through hole relative to said end of said first fluid passage and alignment of said inner end of said through hole relative to said end of said second fluid passage, which loss is caused when said male coupler member is moved in a direction opposite to a direction of insertion of said male coupler member into said male coupler receiving hole, corresponding to cancellation of the fixed connection condition.

19. (New) The fluid coupler according to claim 18, wherein
said second fluid passage comprises an axially extending portion, and a radially extending portion extending from said axially extending portion to said end of said second fluid passage,
and

said male coupler member includes a second valve slidably received in said axially extending portion, said second valve for effecting a fluid connection between said radially extending portion and said axially extending portion when said male coupler member is in the fixed connection condition, and for preventing fluid connection between said radially extending portion and said axially extending portion when said male coupler member is moved in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

20. (New) The fluid coupler according to claim 19, wherein
said interior surface is circular in cross section and concentric with said axis,

said exterior surface is circular in cross section and concentric with said axis when said male coupler member is in the fixed connection condition, and
said first valve is cylindrical and circular in cross section.

21. (New) The fluid coupler according to claim 20, further comprising:
a first locking member that is

(i) engageable with said first valve and said male coupler member so as to prevent relative movement between said first valve and said male coupler member, and

(ii) radially displaceable outwardly by said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to engage with said first valve and said female coupler member after said first valve and said male coupler member have moved a predetermined distance from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, such that said first valve is prevented from continuing to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole and said male coupler member is allowed to continue to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

22. (New) The fluid coupler according to claim 18, wherein
said interior surface is circular in cross section and concentric with said axis,
said exterior surface is circular in cross section and concentric with said axis when said male coupler member is in the fixed connection condition, and
said first valve is cylindrical and circular in cross section.

23. (New) The fluid coupler according to claim 22, further comprising:
a first locking member that is

(i) engageable with said first valve and said male coupler member so as to prevent relative movement between said first valve and said male coupler member, and

(ii) radially displaceable outwardly by said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to engage with said first valve and said female coupler member after said first valve and said male coupler member have moved a predetermined distance from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, such that said first valve is prevented from continuing to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole and said male coupler member is allowed to continue to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

24. (New) The fluid coupler according to claim 18, further comprising:
a first locking member that is

(i) engageable with said first valve and said male coupler member so as to prevent relative movement between said first valve and said male coupler member, and

(ii) radially displaceable outwardly by said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to engage with said first valve and said female coupler member after said first valve and said male coupler member have moved a predetermined distance from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, such that said first valve is prevented from continuing to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole and said male coupler member is allowed to continue to move in the

direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

25. (New) The fluid coupler according to claim 24, further comprising:
a locking member retaining member for engaging said first locking member, such that after said first locking member has been displaced radially outwardly by said male coupler member said locking member retaining member prevents said first locking member from moving radially inwardly.

26. (New) The fluid coupler according to claim 25, further comprising:
a spring member for urging said locking member retaining member in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole,

wherein said locking member retaining member is movable in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole such that when said first locking member is engaged with both said first valve and said male coupler member said locking member retaining member urges said male coupler member and said first valve in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

27. (New) The fluid coupler according to claim 26, wherein said locking member retaining member is positioned between said first valve and said male coupler member when said male coupler member is inserted within said male coupler receiving hole, and is movable relative to said first valve and said male coupler member in a direction parallel to said axis, said fluid coupler further comprising:

a second locking member engageable with said locking member retaining member and said male coupler member to enable said locking member retaining member and said male coupler member to move together in a direction parallel to said axis, and also engageable with

said locking member retaining member and said first valve to enable said male coupler member to move relative to said locking member retaining member, such that

(i) with said second locking member engaged with said locking member retaining member and said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole said locking member retaining member is moved together with said male coupler member and brought into a position, radially inwardly of said first locking member, at which said locking member retaining member engages said first locking member and prevents said first locking member from moving radially inwardly after said male coupler member has passed said first locking member and displaced said first locking member radially outwardly, and

(ii) when said locking member retaining member is brought into the position radially inwardly of said first locking member, said second locking member is permitted to be displaced radially outwardly by said male coupler member, upon movement of said male coupler member in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to enable said second locking member to be engaged by both said locking member support member and said first valve to thereby prevent said locking member retaining member from moving together with said male coupler member while said male coupler member continues to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

28. (New) The fluid coupler according to claim 19, further comprising:

a first locking member that is

(i) engageable with said first valve and said male coupler member so as to prevent relative movement between said first valve and said male coupler member, and

(ii) radially displaceable outwardly by said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to

engage with said first valve and said female coupler member after said first valve and said male coupler member have moved a predetermined distance from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, such that said first valve is prevented from continuing to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole and said male coupler member is allowed to continue to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

29. (New) A fluid coupler comprising:

a tubular female coupler member having

(i) a forward end, a rearward end, and a partition wall between said forward and rearward ends,

(ii) an interior surface defining a male coupler member receiving hole having an axis, said interior surface being circular in cross section and concentric with said axis, said male coupler member receiving hole extending from said forward end towards said rearward end and terminating at said partition wall, and

(iii) a first fluid passage including a first portion extending from said rearward end and terminating at said partition wall, and also including a second portion extending from said first portion, to radially outwardly of said partition wall, and reaching and opening at said interior surface,

a male coupler member having

(i) a forward end and a rearward end,

(ii) an exterior surface, said exterior surface being circular in cross section and concentric with said axis when said male coupler member is within said male coupler member receiving hole, and

(iii) a second fluid passage having an end opening at said exterior surface, said second fluid passage including an axially extending portion extending from said rearward end of

said male coupler member towards said forward end of said male coupler member, and also including a radially extending portion extending from said axially extending portion to said end of said second fluid passage,

said male coupler member being insertable into said male coupler member receiving hole along said axis such that said exterior surface extends parallel to said axis and so as to bring said male coupler member into a fixed connection condition in which said male coupler member is fixedly connected to said female coupler member and retained at a fixed connection position relative to said female coupler member, with the fixed connection condition being designed to be canceled or broken, when an excessive tension is applied to a fluid line in which the fluid coupler is installed, via tension acting on said female and male coupler members that causes said female and male coupler members to separate from one another;

a circular tubular first valve positioned between said exterior surface and said interior surface when said male coupler member is inserted within said male coupler member receiving hole, said first valve having an outer surface and an inner surface to be slidably engaged with said interior surface and said exterior surface, respectively, when said male coupler member is inserted within said male coupler member receiving hole, said first valve also having a through hole having an outer end opening at said outer surface and an inner end opening at said inner surface;

a second valve slidably received in said axially extending portion of said second fluid passage, said second valve having a stem extending through said forward end of said male coupler member; and

a valve spring for urging said second valve towards said forward end of said male coupler member,

such that when said male coupler is in the fixed connection condition,

(i) said outer end of said through hole and said inner end of said through hole are aligned with said end of said first fluid passage and said end of said second fluid passage, respectively, so as to effect fluid communication between said first fluid passage and said second fluid passage, which fluid communication is to be canceled due to loss of at least one of

alignment of said outer end of said through hole relative to said end of said first fluid passage and alignment of said inner end of said through hole relative to said end of said second fluid passage, which loss is caused when said male coupler member is moved in a direction opposite to a direction of insertion of said male coupler member into said male coupler receiving hole, corresponding to cancellation of the fixed connection condition, and

(ii) said stem is abuttingly engaged with said partition wall, whereby said second valve is shifted relative to said male coupler member towards said rearward end of said male coupler member and said valve spring is compressed, to thereby allow said axially extending portion and said radially extending portion of said second fluid passage to be fluidly interconnected, and

wherein said valve spring is for maintaining said second valve in a condition such that said stem is engaged with said partition wall until said male coupler member engages and moves said second valve in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, after said male coupler member moves from the fixed connection condition, so that said second valve blocks fluid communication between said axially extending portion and said radially extending portion of said second fluid passage upon movement of said male coupler member from the fixed connection condition.

30. (New) The fluid coupler according to claim 29, further comprising:
a first locking member that is

(i) engageable with said first valve and said male coupler member so as to prevent said first valve and said male coupler member from moving relative to each other in a direction parallel to said axis, and

(ii) radially displaceable outwardly by said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to engage with said first valve and said female coupler member after said first valve and said male coupler member have moved a predetermined distance from the fixed connection position in the

direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, such that said first valve is prevented from continuing to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole and said male coupler member is allowed to continue to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

31. (New) The fluid coupler according to claim 30, further comprising:
a locking member retaining member for engaging said first locking member, such that after said first locking member has been displaced radially outwardly by said male coupler member said locking member retaining member prevents said first locking member from moving radially inwardly.

32. (New) The fluid coupler according to claim 31, further comprising:
a spring member for urging said locking member retaining member in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole,

wherein said locking member retaining member is movable in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole such that when said first locking member is engaged with both said first valve and said male coupler member said locking member retaining member urges said male coupler member and said first valve in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.

33. (New) The fluid coupler according to claim 32, wherein said locking member retaining member is positioned between said first valve and said male coupler member when said male coupler member is inserted within said male coupler receiving hole, and is movable relative

to said first valve and said male coupler member in a direction parallel to said axis, said fluid coupler further comprising:

a second locking member engageable with said locking member retaining member and said male coupler member to enable said locking member retaining member and said male coupler member to move together in a direction parallel to said axis, and also engageable with said locking member retaining member and said first valve to enable said male coupler member to move relative to said locking member retaining member, such that

(i) with said second locking member engaged with said locking member retaining member and said male coupler member, upon movement of said male coupler member from the fixed connection position in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole said locking member retaining member is moved together with said male coupler member and brought into a position, radially inwardly of said first locking member, at which said locking member retaining member engages said first locking member and prevents said first locking member from moving radially inwardly after said male coupler member has passed said first locking member and displaced said first locking member radially outwardly, and

(ii) when said locking member retaining member is brought into the position radially inwardly of said first locking member, said second locking member is permitted to be displaced radially outwardly by said male coupler member, upon movement of said male coupler member in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole, so as to enable said second locking member to be engaged by both said locking member support member and said first valve to thereby prevent said locking member retaining member from moving together with said male coupler member while said male coupler member continues to move in the direction opposite to the direction of insertion of said male coupler member into said male coupler receiving hole.